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EXTENDED TABLES OF STIFFNESS AND CARRY-OVER FACTOR  
FOR STRUCTURAL MEMBERS UNDER AXIAL LOAD

By Eugene E. Lundquist and W. D. Kroll

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ADVANCE RESTRICTED REPORT

EXTENDED TABLES OF STIFFNESS AND CARRY-OVER FACTOR

FOR STRUCTURAL MEMBERS UNDER AXIAL LOAD

By Eugene E. Lundquist and W. D. Kroll

SUMMARY

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The tables of stiffness and carry-over factor that were presented in NACA Technical Note No. 652 have been extended to include the stiffness of a member with the far end subjected to a moment equal and opposite to the moment applied at the near end. These tables are of use in solving problems in the stability of structural members under axial load as well as in the usual applications of the Cross method of moment distribution when the effects of axial load in the members are considered. The values presented are for structural members in which the cross section and the axial load do not vary along the length of the member. The interval between successive values of the argument is small enough to make interpolation unnecessary in engineering calculations.

INTRODUCTION

The tables of stiffness and carry-over factor given in reference 1 have been found useful in the applications of moment-distribution methods to a number of structural problems. Recent studies have shown the desirability of including in these tables an additional stiffness that was not formerly presented. The present paper has therefore been written to include in the tables values for this additional stiffness as well as the material of reference 1 and consequently supersedes reference 1.

The method of moment distribution developed by Hardy Cross (reference 2) can frequently be used to advantage in the stress analysis of continuous beams, continuous frames, and rigid joint trusses, some of which occur in aeronautical structures. In reference 3, James summarized the principles of the Cross method and showed how the effects of axial load in the members may be considered in a moment-distribution analysis. In reference 4, it was shown how the principles of moment distribution may be

used to solve problems in the stability of structural members under axial load.

In the stability calculations as well as in the more usual type of moment-distribution analysis in which the effects of axial load are considered, it is desirable to have tables giving the stiffness and the carry-over factor as a function of the axial load and properties of the member. Such a set of tables was presented in reference 1.

In the use of the principles of moment distribution as applied to the stability of plates (reference 5) the stiffness of a plate with the far edge subjected to a moment equal and opposite to the moment applied at the near edge was found useful in stability problems in which the assembly of plates was symmetrical about a plate. Because the equations that must be satisfied for the stability of plates are identical in their general form to those for bars under axial load, a corresponding stiffness for bars is desirable. As is the case for plates, this stiffness is designated  $S_{IV}$ , and values are presented herein.

The tables apply to members for which the cross section and axial load do not vary along the length of the member. The interval between successive values of the argument was made sufficiently small that interpolation would be unnecessary for most engineering calculations.

#### SYMBOLS

$E$	modulus of elasticity
$\bar{E}$	effective modulus of elasticity for stresses beyond the elastic range
$I$	moment of inertia of cross section about centroidal axis perpendicular to plane of bending
$L$	length of member
$P$	axial load in member (absolute value)



$$\alpha = 6 \frac{\frac{L}{j} \csc \frac{L}{j} - 1}{\left(\frac{L}{j}\right)^2}$$

$$\beta = 3 \frac{1 - \frac{L}{j} \cot \frac{L}{j}}{\left(\frac{L}{j}\right)^2}$$

For compression members

$$\alpha = 6 \frac{\frac{L}{j} \operatorname{csch} \frac{L}{j} - 1}{-\left(\frac{L}{j}\right)^2}$$

$$\beta = 3 \frac{1 - \frac{L}{j} \operatorname{coth} \frac{L}{j}}{-\left(\frac{L}{j}\right)^2}$$

For tension members

$$j = \sqrt{\frac{EI}{P}}$$

$$\frac{L}{j} = L \sqrt{\frac{P}{EI}}$$

$$\left(\frac{L}{j}\right)_{\text{eff}} = L \sqrt{\frac{P}{EI}}$$

Effective values of  $\alpha$  and  $\beta$  are obtained by substitution of  $(L/j)_{\text{eff}}$  for  $L/j$ .

The symbols used to designate the stiffness and carry-over factor for the different types of restraint at the far end are given in the following table and correspond to those used in reference 5:

Stiffness	Carry-over factor	Conditions at far end
S	C	Far end fixed against rotation.
$S^I$	$C^I$	Far end elastically restrained against rotation.
$S^{II}$	$C^{II} = 0$	No restraint against rotation at far end.
$S^{IV}$	$C^{IV} = -1$	Far end subjected to a moment equal and opposite to that applied at near end

The quantities  $S^I$ ,  $C^I$ ,  $S^{II}$ , and  $C^{II}$  of this paper are the quantities  $S'$ ,  $C'$ ,  $S''$ , and  $C''$ , respectively, of references 1 and 4.

#### DEFINITIONS

The following definitions of carry-over factor and stiffness are the same as those given in reference 4.

Carry-over factor.- If a member is on unyielding supports at each end and a moment is applied at the near end, the ratio of the moment developed at the far end to the moment applied at the near end is called the carry-over factor.

Stiffness.- If a member is on unyielding supports at each end, the moment at one end necessary to produce a rotation of one-fourth radian of that end is called the stiffness.



The stiffness of a member computed according to this definition is one-fourth that computed according to the definition used by Cross (reference 2). In the Cross method, the relative stiffness of the members is of importance and not the absolute value. The foregoing definition was selected so that the stiffness of a member of constant cross section with no axial load and fixed at the far end would be  $\bar{EI}/L$  instead of  $4\bar{EI}/L$ .

Sign convention.— The sign convention used in this report is the same as that used in references 4 and 5. A clockwise moment acting on the end of a member is positive. An external moment applied at a joint is considered to act on the joint; a counterclockwise moment acting on a joint is positive.

## TABLES

Tables I and II do not give directly the values of stiffness but give, instead, values of stiffness divided by a factor  $\bar{EI}/L$ . The actual stiffnesses are therefore obtained by multiplying the values in the tables by  $\bar{EI}/L$ . The value of  $C$  is read directly from the tables.

Formulas used in calculation.— The quantities  $\frac{S}{\bar{EI}/L}$ ,  $\frac{S^{II}}{\bar{EI}/L}$ ,  $\frac{S^{IV}}{\bar{EI}/L}$ , and  $C$  are tabulated for values of  $(L/j)_{\text{eff}}$  in tables I and II for compression and tension, respectively. The stiffness  $S^I$  and carry-over factor  $C^I$  that apply when the far end of the member is elastically restrained are dependent on the restraint at the far end and can be computed by the formulas given in reference 4 or 5.

In the elastic range of the material comprising the members,  $\bar{E} = E$  and  $\left(\frac{L}{j}\right)_{\text{eff}} = \left(\frac{L}{j}\right)$ . Above the elastic range, however, it is necessary to use a reduced modulus  $\bar{E}$  which is called the effective modulus. A method for obtaining the effective modulus from the accepted column formula for the material is described in reference 4.

The formulas used in calculating the second, third, fourth, and seventh columns in tables I and II are:

$$C = \frac{a}{2\beta} \quad (1)$$

$$\frac{S^{II}}{\bar{EI}/L} = \frac{3}{4\beta} \quad (2)$$

$$\frac{S}{\bar{EI}/L} = \frac{S^{II}}{\bar{EI}/L} \left[ \frac{1}{1 - C^2} \right] \quad (3)$$

$$\frac{S^{IV}}{\bar{EI}/L} = \frac{S^{II}}{\bar{EI}/L} \left[ \frac{1}{1 + C} \right] \quad (4)$$

Equations (1) and (2) were first presented by James in reference 3. Equation (3) follows from equation (13) of reference 4, and equation (4), from equation (14) of reference 5.

The fifth and sixth columns in tables I and II were obtained from the preceding columns, as indicated by their headings. These columns are included as a convenience because they are of use in some stability calculations (reference 4).

Accuracy of tables.— The tables of reference 6 were used in the preparation of tables I and II. All values presented are accurate to the number of places given. Equations (1), (2), and (3) were used to calculate the second, third, and fourth columns, respectively. The fifth column was obtained by squaring the second column. The sixth column was obtained by squaring the fourth column and multiplying by the fifth column. The sixth column was therefore made to depend on all preceding columns. All values were tabulated to six significant figures and the differences for the last column were taken; in some cases differences as high as the fourth order were used. The differences were studied and, where irregularities occurred, the tables were checked.



An independent check was also made of a series of values throughout the tables. The values for  $\frac{S^{IV}}{EI/L}$  were computed from equation (4) and were independently checked.

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#### REFERENCES

1. Lundquist, Eugene E., and Kroll, W. D.: Tables of Stiffness and Carry-Over Factor for Structural Members under Axial Load. T.N. No. 652, NACA, 1938.
2. Cross, Hardy: Analysis of Continuous Frames by Distributing Fixed-End Moments. Trans. A.S.C.E., vol. 96, 1932, pp. 1-10.
3. James, Benjamin Wylie: Principal Effects of Axial Load on Moment-Distribution Analysis of Rigid Structures. T.N. No. 534, NACA, 1935.
4. Lundquist, Eugene E.: Stability of Structural Members under Axial Load. T.N. No. 617, NACA, 1937.
5. Lundquist, Eugene E., Stowell, Elbridge Z., and Schuette, Evan H.: Principles of Moment Distribution Applied to Stability of Structures Composed of Bars or Plates. NACA ARR No. 3K06, Nov. 1943.
6. Hayashi, Keiichi: Sieben- und mehrstellige Tafeln der Kreis- und Hyperbelfunktionen und deren Producte sowie der Gammafunktion. Julius Springer (Berlin), 1926.

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TABLE I.- COMPRESSION

TABLE I.- COMPRESSION - Continued

$\left(\frac{L}{j}\right)_{\text{eff}}$	C	$\frac{s_{II}}{EI/L}$	$\frac{s}{EI/L}$	$C^2$	$\frac{s^2 C^2}{(EI/L)^2}$	$\frac{s_{IV}}{EI/L}$	$\left(\frac{L}{j}\right)_{\text{eff}}$	C	$\frac{s_{II}}{EI/L}$	$\frac{s}{EI/L}$	$C^2$	$\frac{s^2 C^2}{(EI/L)^2}$	$\frac{s_{IV}}{EI/L}$
0	0.500000	0.750000	1.000000	0.250000	0.250000	0.500000	1.36	0.551183	0.552192	0.936792	0.303803	0.266611	0.420418
1	0.50243	0.749505	0.999664	0.250243	0.250075	0.499589	1.37	0.552021	0.550661	0.935035	0.304727	0.266376	0.419235
2	0.501001	0.747996	0.998663	0.251002	0.250332	0.498347	1.38	0.552667	0.549116	0.934070	0.305662	0.266143	0.418012
3	0.502260	0.745488	0.996996	0.252265	0.250752	0.496824	1.39	0.553722	0.547557	0.932897	0.306608	0.265912	0.416778
4	0.504034	0.741963	0.994656	0.251050	0.251342	0.493315	1.40	0.554385	0.545984	0.932917	0.307565	0.265684	0.415535
5	0.506333	0.737410	0.991639	0.253773	0.252104	0.489540	1.41	0.555158	0.544397	0.931926	0.308534	0.265459	0.414281
6	0.509173	0.731812	0.987943	0.259257	0.253043	0.484909	1.42	0.556340	0.542795	0.930932	0.309515	0.265236	0.413017
7	0.512572	0.725161	0.985561	0.262730	0.254163	0.479115	1.43	0.557231	0.541179	0.929928	0.310507	0.265016	0.411743
8	0.516555	0.717398	0.982486	0.266829	0.255471	0.473004	1.44	0.558332	0.539549	0.928936	0.311511	0.264798	0.410459
9	0.521116	0.708528	0.978709	0.271593	0.256971	0.465785	1.45	0.559011	0.537903	0.92796	0.312527	0.264584	0.409164
1.0	0.526380	0.698505	0.966221	0.277075	0.258673	0.457622	1.46	0.559961	0.536244	0.926969	0.313556	0.264371	0.407859
1.01	0.526940	0.697438	0.965532	0.277665	0.258854	0.456755	1.47	0.560889	0.534569	0.925933	0.314597	0.264162	0.406543
1.02	0.527506	0.696358	0.964837	0.278263	0.259038	0.455879	1.48	0.561827	0.532880	0.924870	0.315650	0.263955	0.405218
1.03	0.528080	0.695267	0.964134	0.278869	0.259224	0.454994	1.49	0.562775	0.531176	0.923736	0.316716	0.263751	0.403881
1.04	0.528661	0.694164	0.963424	0.279482	0.259411	0.454099	1.50	0.563733	0.529457	0.922679	0.317794	0.263550	0.402535
1.05	0.529249	0.693049	0.962707	0.280104	0.259602	0.453196	1.51	0.564700	0.527723	0.921611	0.318886	0.263351	0.401178
1.06	0.529843	0.691921	0.961982	0.280734	0.259794	0.452282	1.52	0.565677	0.525973	0.920436	0.319990	0.263155	0.399810
1.07	0.530445	0.690782	0.961250	0.281372	0.259988	0.451360	1.53	0.566664	0.524209	0.919192	0.321108	0.262962	0.398432
1.08	0.531054	0.689630	0.960511	0.282018	0.260185	0.450428	1.54	0.567661	0.522429	0.917931	0.322239	0.262772	0.397043
1.09	0.531669	0.688466	0.959764	0.282672	0.260383	0.449487	1.55	0.568668	0.520634	0.916641	0.323384	0.262585	0.395644
1.10	0.532293	0.687299	0.959011	0.283336	0.260584	0.448536	1.56	0.569686	0.518823	0.915333	0.324542	0.262400	0.394233
1.11	0.532923	0.686100	0.958249	0.284007	0.260787	0.447576	1.57	0.570714	0.516996	0.913996	0.325714	0.262218	0.392813
1.12	0.533561	0.684899	0.957481	0.284687	0.260992	0.446609	1.58	0.571752	0.515154	0.912631	0.326901	0.262040	0.391381
1.13	0.534205	0.683695	0.956705	0.285375	0.261200	0.445628	1.59	0.572801	0.513296	0.911241	0.328101	0.261866	0.389939
1.14	0.534858	0.682459	0.955922	0.286073	0.261410	0.444640	1.60	0.573861	0.511423	0.909811	0.329316	0.261695	0.388486
1.15	0.535517	0.681220	0.955131	0.286779	0.261621	0.443642	1.61	0.574931	0.509533	0.908422	0.330546	0.261527	0.387022
1.16	0.536185	0.679968	0.954333	0.287494	0.261836	0.442634	1.62	0.576012	0.507627	0.906935	0.331790	0.261360	0.385547
1.17	0.536859	0.678704	0.953527	0.288218	0.262052	0.441617	1.63	0.577101	0.505705	0.905410	0.333049	0.261196	0.384061
1.18	0.537542	0.677427	0.952715	0.288951	0.262271	0.440591	1.64	0.578207	0.503766	0.903857	0.334323	0.261035	0.382565
1.19	0.538232	0.676137	0.951894	0.289693	0.262492	0.439555	1.65	0.579321	0.501812	0.902271	0.335613	0.260877	0.381057
1.20	0.538929	0.674834	0.951066	0.290445	0.262715	0.438509	1.66	0.580446	0.500040	0.900625	0.336916	0.260716	0.379539
1.21	0.539635	0.673518	0.950231	0.291206	0.262941	0.437453	1.67	0.581583	0.498253	0.898927	0.338233	0.260559	0.378009
1.22	0.540348	0.672190	0.949388	0.291976	0.263169	0.436388	1.68	0.582731	0.496446	0.897196	0.339576	0.260400	0.376468
1.23	0.541069	0.670848	0.948538	0.292755	0.263399	0.435314	1.69	0.583891	0.494626	0.895430	0.340939	0.260240	0.374916
1.24	0.541798	0.669493	0.947680	0.293545	0.263632	0.434229	1.70	0.585062	0.492793	0.893637	0.342326	0.260080	0.373353
1.25	0.542535	0.668125	0.946814	0.294344	0.263867	0.433135	1.71	0.586245	0.490932	0.891809	0.343739	0.259920	0.371779
1.26	0.543279	0.666744	0.945941	0.295153	0.264104	0.432031	1.72	0.587440	0.489060	0.890000	0.345176	0.259760	0.370193
1.27	0.544033	0.665350	0.945061	0.295971	0.264344	0.430917	1.73	0.588649	0.487176	0.888206	0.346636	0.259600	0.368600
1.28	0.544791	0.663942	0.944173	0.296800	0.264586	0.429793	1.74	0.589867	0.485282	0.886382	0.348119	0.259440	0.367000
1.29	0.545556	0.662521	0.943277	0.297639	0.264830	0.428660	1.75	0.591098	0.483377	0.884536	0.349627	0.259280	0.365360
1.30	0.546331	0.661086	0.942374	0.298488	0.265076	0.427517	1.76	0.592342	0.481464	0.882661	0.351157	0.259120	0.363737
1.31	0.547127	0.659638	0.941462	0.299347	0.265327	0.426363	1.77	0.593598	0.479540	0.880767	0.352709	0.258960	0.362095
1.32	0.547921	0.658176	0.940544	0.300217	0.265579	0.425200	1.78	0.594868	0.477605	0.878844	0.354291	0.258800	0.360444
1.33	0.548724	0.656701	0.939618	0.301098	0.265833	0.424027	1.79	0.596149	0.475660	0.876899	0.355895	0.258640	0.358775
1.34	0.549535	0.655212	0.938683	0.301989	0.266090	0.422844	1.80	0.597444	0.473704	0.874933	0.357519	0.258480	0.357100
1.35	0.550355	0.653709	0.937742	0.302890	0.266350	0.421651							





TABLE I.- COMPRESSION - Continued

TABLE I.- COMPRESSION - Continued

$\frac{L}{J}$ , eff	C	$\frac{S_{II}}{E/L}$	$\frac{s}{E/L}$	$C^2$	$\frac{S^2 C^2}{(E/L)^2}$	$\frac{S_{IV}}{E/L}$	$\left(\frac{L}{J}\right)_{eff}$	C	$\frac{S_{II}}{E/L}$	$\frac{s}{E/L}$	$C^2$	$\frac{S^2 C^2}{(E/L)^2}$	$\frac{S_{IV}}{E/L}$
1.81	0.598752	0.568211	0.885759	0.358504	0.281271	0.355409	2.26	0.673739	0.444120	0.816955	0.445324	0.302936	0.266541
1.82	0.600073	0.569960	0.881432	0.360087	0.281667	0.353709	2.27	0.675836	0.442855	0.815203	0.445836	0.303559	0.267259
1.83	0.601407	0.563689	0.883097	0.361690	0.282066	0.351996	2.28	0.677956	0.439563	0.813440	0.445964	0.304127	0.267984
1.84	0.602754	0.561401	0.881753	0.363313	0.282471	0.350272	2.29	0.680099	0.436243	0.811667	0.446079	0.304719	0.268653
1.85	0.604116	0.559393	0.880400	0.364956	0.282878	0.348537	2.30	0.682265	0.432895	0.809684	0.446185	0.305317	0.269329
1.86	0.605491	0.557666	0.879038	0.366619	0.283289	0.346789	2.31	0.684454	0.429518	0.808090	0.446276	0.305920	0.269999
1.87	0.606870	0.554420	0.877667	0.368302	0.283703	0.345029	2.32	0.686688	0.426112	0.806266	0.446352	0.306529	0.270655
1.88	0.608255	0.552055	0.876288	0.370007	0.284121	0.343257	2.33	0.688905	0.422677	0.804471	0.446419	0.307142	0.271307
1.89	0.609699	0.549670	0.874899	0.371733	0.284534	0.341474	2.34	0.691167	0.419212	0.802645	0.446477	0.307761	0.271953
1.90	0.611131	0.547266	0.873502	0.373480	0.284946	0.339678	2.35	0.693454	0.415718	0.800809	0.446526	0.308385	0.272595
1.91	0.612576	0.544832	0.872095	0.375250	0.285366	0.337870	2.36	0.695766	0.412193	0.799963	0.446566	0.309044	0.273232
1.92	0.614037	0.542398	0.870680	0.377011	0.285789	0.336050	2.37	0.698103	0.408638	0.797105	0.446597	0.309649	0.273864
1.93	0.615512	0.539933	0.869255	0.378765	0.286215	0.334218	2.38	0.700466	0.405051	0.795237	0.446619	0.310290	0.274491
1.94	0.617002	0.537449	0.867822	0.380692	0.286640	0.332374	2.39	0.702856	0.401434	0.793358	0.446632	0.310936	0.275112
1.95	0.618508	0.534944	0.866379	0.382552	0.287064	0.330517	2.40	0.705272	0.397785	0.791468	0.446636	0.311587	0.275728
1.96	0.620028	0.532419	0.864927	0.384435	0.287496	0.328648	2.41	0.707715	0.394104	0.789567	0.446630	0.312245	0.276339
1.97	0.621565	0.529872	0.863466	0.386343	0.287930	0.326766	2.42	0.710186	0.390391	0.787655	0.446614	0.312909	0.276944
1.98	0.623117	0.527305	0.861996	0.388274	0.288362	0.324872	2.43	0.712684	0.386664	0.785733	0.446588	0.313576	0.277544
1.99	0.624684	0.524717	0.860517	0.390230	0.288791	0.322965	2.44	0.715210	0.382866	0.783811	0.446552	0.314251	0.278136
2.00	0.626268	0.522107	0.859028	0.392211	0.289221	0.321046	2.45	0.717765	0.379053	0.781894	0.446506	0.314931	0.278721
2.01	0.627868	0.519476	0.857530	0.394218	0.289691	0.319115	2.46	0.720349	0.375207	0.779988	0.446450	0.315617	0.279299
2.02	0.629484	0.516823	0.856032	0.396250	0.290162	0.317170	2.47	0.722962	0.371326	0.778093	0.446384	0.316310	0.279871
2.03	0.631117	0.514149	0.854506	0.398309	0.290637	0.315213	2.48	0.725605	0.367411	0.776207	0.446308	0.317008	0.280437
2.04	0.632767	0.511452	0.852980	0.400393	0.291116	0.313243	2.49	0.728273	0.363461	0.774329	0.446222	0.317713	0.280992
2.05	0.634433	0.508733	0.851444	0.402505	0.291599	0.311260	2.50	0.730983	0.359475	0.772461	0.446126	0.318423	0.281536
2.06	0.636117	0.505992	0.849899	0.404645	0.292086	0.309264	2.51	0.733718	0.355453	0.769946	0.446020	0.319140	0.282073
2.07	0.637818	0.503228	0.848345	0.406812	0.292578	0.307255	2.52	0.736485	0.351394	0.767824	0.445904	0.319863	0.282604
2.08	0.639537	0.500441	0.846781	0.409007	0.293074	0.305233	2.53	0.739284	0.347299	0.765688	0.445778	0.320593	0.283128
2.09	0.641271	0.497631	0.845207	0.411231	0.293573	0.303198	2.54	0.742116	0.343167	0.763841	0.445642	0.321328	0.283645
2.10	0.643028	0.494798	0.843624	0.413485	0.294076	0.301150	2.55	0.744980	0.338996	0.761782	0.445496	0.322071	0.284159
2.11	0.644800	0.491942	0.842031	0.415768	0.294586	0.299089	2.56	0.747879	0.334788	0.759712	0.445340	0.322820	0.284665
2.12	0.646592	0.489062	0.840429	0.418081	0.295096	0.297044	2.57	0.750812	0.330540	0.757629	0.445174	0.323575	0.285166
2.13	0.648391	0.486157	0.838816	0.420424	0.295604	0.294947	2.58	0.753779	0.326253	0.755535	0.444998	0.324338	0.285662
2.14	0.650203	0.483229	0.837194	0.422792	0.296116	0.292825	2.59	0.756781	0.321927	0.753429	0.444812	0.325107	0.286153
2.15	0.652078	0.480276	0.835562	0.425206	0.296634	0.290710	2.60	0.759820	0.317560	0.751311	0.444616	0.325882	0.286635
2.16	0.653945	0.477299	0.833921	0.427644	0.297154	0.288582	2.61	0.762894	0.313152	0.749181	0.444410	0.326665	0.287108
2.17	0.655832	0.474297	0.832269	0.430116	0.297699	0.286440	2.62	0.766006	0.308703	0.747040	0.444194	0.327455	0.287573
2.18	0.657739	0.471273	0.830608	0.432620	0.298246	0.284285	2.63	0.769155	0.304211	0.744885	0.443968	0.328252	0.288030
2.19	0.659666	0.468217	0.828937	0.435159	0.298793	0.282116	2.64	0.772342	0.299678	0.742719	0.443732	0.329055	0.288479
2.20	0.661613	0.465135	0.827255	0.437732	0.299342	0.279932	2.65	0.775568	0.295101	0.740541	0.443486	0.329866	0.288920
2.21	0.663581	0.462036	0.825564	0.440339	0.300116	0.277736	2.66	0.778834	0.290480	0.738350	0.443230	0.330685	0.289356
2.22	0.665570	0.458906	0.823862	0.442983	0.300674	0.275525	2.67	0.782139	0.285815	0.736147	0.442964	0.331510	0.289787
2.23	0.667579	0.455749	0.822151	0.445662	0.301237	0.273300	2.68	0.785485	0.281105	0.733931	0.442688	0.332343	0.290210
2.24	0.669611	0.452566	0.820429	0.448378	0.301805	0.271061	2.69	0.788873	0.276349	0.731703	0.442402	0.333184	0.290625
2.25	0.671664	0.449357	0.818697	0.451132	0.302378	0.268808	2.70	0.792302	0.271547	0.729462	0.442106	0.334032	0.291032





TABLE I.- COMPRESSION - Continued

$\left(\frac{1}{f}\right)_{\text{eff}}$	$c$	$\frac{s_{II}}{EI/L}$	$\frac{s}{EI/L}$	$c^2$	$\frac{s^2 c^2}{(EI/L)^2}$	$\frac{s_{IV}}{EI/L}$
2.71	0.795775	0.266699	0.727209	0.633257	0.374888	0.144515
2.72	0.792200	0.261802	0.724943	0.638865	0.375751	0.145503
2.73	0.802850	0.256858	0.722665	0.644569	0.376621	0.146473
2.74	0.804455	0.251864	0.720373	0.650370	0.377501	0.147424
2.75	0.810106	0.246820	0.718069	0.656272	0.378369	0.148357
2.76	0.813803	0.241727	0.715751	0.662276	0.379287	0.149271
2.77	0.817548	0.236581	0.713421	0.668385	0.380161	0.150165
2.78	0.821341	0.231384	0.711078	0.674600	0.381099	0.151041
2.79	0.825182	0.226134	0.708721	0.680926	0.382019	0.151897
2.80	0.829074	0.220831	0.706351	0.687364	0.382947	0.152734
2.81	0.832917	0.215473	0.703966	0.693917	0.383885	0.153551
2.82	0.837011	0.210060	0.701571	0.700567	0.384830	0.154351
2.83	0.841057	0.204590	0.699161	0.707378	0.385785	0.155136
2.84	0.845158	0.199064	0.696737	0.714292	0.386746	0.155906
2.85	0.849313	0.193479	0.694300	0.721332	0.387720	0.156661
2.86	0.853523	0.187836	0.691849	0.728502	0.388701	0.157401
2.87	0.857790	0.182133	0.689384	0.735804	0.389691	0.158126
2.88	0.862115	0.176369	0.686907	0.743242	0.390691	0.158836
2.89	0.866498	0.170543	0.684413	0.750819	0.391699	0.159531
2.90	0.870941	0.164654	0.681906	0.758539	0.392715	0.160211
2.91	0.875446	0.158701	0.679386	0.766405	0.393746	0.160876
2.92	0.880012	0.152683	0.676850	0.774421	0.394783	0.161526
2.93	0.884642	0.146599	0.674301	0.782591	0.395826	0.162161
2.94	0.889336	0.140448	0.671738	0.790919	0.396888	0.162781
2.95	0.894096	0.134228	0.669160	0.799408	0.397955	0.163386
2.96	0.898923	0.127930	0.666567	0.808063	0.399032	0.163976
2.97	0.903819	0.121579	0.663960	0.816888	0.400118	0.164551
2.98	0.908784	0.115147	0.661338	0.825889	0.401218	0.165111
2.99	0.913821	0.108641	0.658702	0.835068	0.402326	0.165656
3.00	0.918930	0.102060	0.656050	0.844432	0.403444	0.166186
3.01	0.924113	0.0954039	0.653384	0.853985	0.404575	0.166701
3.02	0.929372	0.0886608	0.650701	0.863732	0.405715	0.167201
3.03	0.934708	0.0818568	0.648005	0.873679	0.406866	0.167686
3.04	0.940123	0.0749833	0.645292	0.883830	0.408026	0.168156
3.05	0.945616	0.0679879	0.642565	0.894193	0.409193	0.168611
3.06	0.951195	0.0609290	0.639822	0.904772	0.410369	0.169061
3.07	0.956856	0.0537050	0.637063	0.915573	0.411551	0.169506
3.08	0.962603	0.0463489	0.634289	0.926604	0.412746	0.169946
3.09	0.968437	0.0388350	0.631499	0.937870	0.413944	0.170381
3.10	0.974360	0.0312357	0.628694	0.949378	0.415151	0.170801
3.11	0.980375	0.0234243	0.625872	0.961135	0.416366	0.171216
3.12	0.986483	0.0154291	0.623035	0.973149	0.417589	0.171626
3.13	0.992687	0.00733818	0.620182	0.985427	0.418819	0.172031
3.14	0.998987	0.00124960	0.617242	0.997976	0.420056	0.172431
3.15	1.00539	0.00000	0.614320	1.00000	0.421291	0.172826

TABLE I.- COMPRESSIOI: - Continued

$\left(\frac{1}{f}\right)_{\text{eff}}$	$c$	$\frac{s_{II}}{EI/L}$	$\frac{s}{EI/L}$	$c^2$	$\frac{s^2 c^2}{(EI/L)^2}$	$\frac{s_{IV}}{EI/L}$
3.16	1.01189	-0.0146287	0.611520	1.02392	0.382903	-0.00727111
3.17	1.01850	-0.0227226	0.608598	1.03734	0.384221	-0.0112572
3.18	1.02521	-0.0309225	0.605682	1.05106	0.385536	-0.0152608
3.19	1.03203	-0.0392308	0.602708	1.06509	0.386802	-0.0193062
3.20	1.03897	-0.0476498	0.599738	1.07945	0.388233	-0.0233696
3.21	1.04601	-0.0561818	0.596750	1.09415	0.389637	-0.0274592
3.22	1.05318	-0.0648294	0.593745	1.10918	0.391026	-0.0315751
3.23	1.06046	-0.0735951	0.590723	1.12448	0.392408	-0.0357177
3.24	1.06787	-0.0824916	0.587683	1.14005	0.393844	-0.0398872
3.25	1.07541	-0.0914915	0.584625	1.15580	0.395275	-0.0440837
3.26	1.08307	-0.100628	0.581551	1.17173	0.396721	-0.0483074
3.27	1.09086	-0.109893	0.578459	1.18785	0.398183	-0.0525567
3.28	1.09879	-0.119290	0.575346	1.20416	0.399650	-0.0568378
3.29	1.10686	-0.128823	0.572216	1.22066	0.401149	-0.0611448
3.30	1.11506	-0.138494	0.569072	1.22837	0.402656	-0.0654800
3.31	1.12342	-0.148307	0.565906	1.23627	0.404176	-0.0698437
3.32	1.13192	-0.158266	0.562723	1.24435	0.405716	-0.0742361
3.33	1.14058	-0.168372	0.559520	1.25260	0.407270	-0.0786574
3.34	1.14939	-0.178632	0.556299	1.32111	0.408841	-0.0831079
3.35	1.15837	-0.189047	0.553056	1.34162	0.410427	-0.0875876
3.36	1.16751	-0.199622	0.549799	1.36308	0.412031	-0.0920975
3.37	1.17681	-0.210362	0.546521	1.38491	0.413652	-0.0966371
3.38	1.18631	-0.221270	0.543223	1.40733	0.415290	-0.101207
3.39	1.19597	-0.232350	0.539905	1.43035	0.416945	-0.105807
3.40	1.20582	-0.243607	0.536569	1.45401	0.418618	-0.110438
3.41	1.21586	-0.255047	0.533212	1.47832	0.420309	-0.115100
3.42	1.22610	-0.266673	0.529835	1.50331	0.422016	-0.119794
3.43	1.23653	-0.278491	0.526438	1.52901	0.423746	-0.124519
3.44	1.24717	-0.290505	0.523021	1.55544	0.425492	-0.129276
3.45	1.25802	-0.302722	0.519584	1.58262	0.427257	-0.134065
3.46	1.26909	-0.315147	0.516126	1.61060	0.429041	-0.138887
3.47	1.28039	-0.327785	0.512648	1.63940	0.430841	-0.143741
3.48	1.29192	-0.340644	0.509146	1.66905	0.432657	-0.148628
3.49	1.30368	-0.353728	0.505627	1.69958	0.434481	-0.153549
3.50	1.31569	-0.367045	0.502085	1.73104	0.436316	-0.158504
3.51	1.32795	-0.380602	0.498522	1.76346	0.438166	-0.163492
3.52	1.34048	-0.394405	0.494937	1.79686	0.440136	-0.168515
3.53	1.35327	-0.408463	0.491330	1.83134	0.442129	-0.173572
3.54	1.36634	-0.422762	0.487701	1.86689	0.444144	-0.178665
3.55	1.37970	-0.437371	0.484051	1.90356	0.446184	-0.183793
3.56	1.39335	-0.452338	0.480377	1.94142	0.448247	-0.188956
3.57	1.40731	-0.467592	0.476682	1.98051	0.450334	-0.194155
3.58	1.42158	-0.482941	0.472963	2.02089	0.452445	-0.199391
3.59	1.43618	-0.498597	0.469222	2.06260	0.454581	-0.204664
3.60	1.45111	-0.514568	0.465457	2.10572	0.456742	-0.209973





TABLE I.- COMPRESSION - Continued

TABLE I.- COMPRESSION - Continued

$\left(\frac{L}{J}\right)_{\text{eff}}$	C	$\frac{S}{E/L}$	C <sup>2</sup>	$\frac{S^2 C^2}{(E/L)^2}$	$\frac{SIV}{E/L}$	$\left(\frac{L}{J}\right)_{\text{eff}}$	C	$\frac{SII}{E/L}$	$\frac{S}{E/L}$	C <sup>2</sup>	$\frac{S^2 C^2}{(E/L)^2}$	$\frac{SIV}{E/L}$
3.61	1.4639	0.461670	2.15031	0.458315	-0.215320	4.06	2.90673	-1.96069	0.263212	8.44909	0.585356	-0.501874
3.62	1.46204	0.457859	2.13617	0.460418	-0.20705	4.07	2.97107	-2.02162	0.258075	8.84510	0.569105	-0.509457
3.63	1.45805	0.454024	2.12416	0.462606	-0.20128	4.08	3.04469	-2.09153	0.252900	9.27016	0.552906	-0.517104
3.64	1.45145	0.450165	2.10935	0.464789	-0.19589	4.09	3.11889	-2.16183	0.247689	9.72720	0.536611	-0.524614
3.65	1.53126	0.446282	2.34474	0.466997	-0.237090	4.10	3.19680	-2.23517	0.242439	10.2195	0.600668	-0.532589
3.66	1.54347	0.442375	2.39776	0.469231	-0.242630	4.11	3.27985	-2.31241	0.237151	10.7508	0.604631	-0.540430
3.67	1.56120	0.438434	2.45272	0.471491	-0.248209	4.12	3.36532	-2.39366	0.231824	11.3254	0.608650	-0.548337
3.68	1.58120	0.434466	2.50971	0.473778	-0.253829	4.13	3.45589	-2.47924	0.226457	11.9479	0.612726	-0.556311
3.69	1.60276	0.430505	2.56863	0.476091	-0.259489	4.14	3.5504	-2.56952	0.221051	12.6211	0.616861	-0.564353
3.70	1.62179	0.426573	2.63019	0.478432	-0.265190	4.15	3.65515	-2.66491	0.215605	13.3602	0.621054	-0.572425
3.71	1.64131	0.422665	2.69391	0.480801	-0.270933	4.16	3.76343	-2.76597	0.210118	14.1634	0.625328	-0.580646
3.72	1.66136	0.418707	2.76011	0.483193	-0.276718	4.17	3.87613	-2.87290	0.204590	15.0422	0.629624	-0.588999
3.73	1.68194	0.414723	2.82893	0.485625	-0.282544	4.18	4.00082	-2.98660	0.199020	16.0065	0.634003	-0.597223
3.74	1.70308	0.410713	2.90049	0.488060	-0.288414	4.19	4.13130	-3.10762	0.193408	17.0677	0.638445	-0.605620
3.75	1.72480	0.406677	2.97495	0.490565	-0.294326	4.20	4.27073	-3.23670	0.187753	18.2391	0.642953	-0.614090
3.76	1.74713	0.402616	3.05247	0.493080	-0.300283	4.21	4.42004	-3.37471	0.182055	19.5367	0.647527	-0.622636
3.77	1.77009	0.398532	3.13322	0.495625	-0.306283	4.22	4.58031	-3.52261	0.176313	20.9793	0.652170	-0.631257
3.78	1.79371	0.394432	3.21738	0.498202	-0.312328	4.23	4.75280	-3.68153	0.170527	22.5891	0.656881	-0.639955
3.79	1.81801	0.390304	3.30511	0.500810	-0.318418	4.24	4.93895	-3.85278	0.164696	24.3933	0.661663	-0.648731
3.80	1.84302	0.386159	3.39672	0.503451	-0.324554	4.25	5.14045	-4.03787	0.158820	26.4243	0.666517	-0.657586
3.81	1.86878	0.382009	3.49234	0.506124	-0.330735	4.26	5.35927	-4.23858	0.152897	28.7218	0.671445	-0.666520
3.82	1.89532	0.377836	3.59224	0.508830	-0.336963	4.27	5.59774	-4.45701	0.146912	31.3347	0.676418	-0.675536
3.83	1.92288	0.373693	3.69669	0.511570	-0.343239	4.28	5.85861	-4.69546	0.140912	34.3323	0.681357	-0.684635
3.84	1.95088	0.369573	3.80595	0.514345	-0.349561	4.29	6.14420	-4.95716	0.134847	37.7634	0.686264	-0.693817
3.85	1.97938	0.365420	3.92034	0.517154	-0.355932	4.30	6.46118	-5.24604	0.128735	41.7506	0.691921	-0.703083
3.86	2.01002	0.361278	4.04017	0.519999	-0.362352	4.31	6.81233	-5.56579	0.122573	46.4079	0.697240	-0.712436
3.87	2.04103	0.357148	4.16581	0.522879	-0.368820	4.32	7.20372	-5.92207	0.116362	51.8937	0.702641	-0.721875
3.88	2.07307	0.353034	4.29763	0.525797	-0.375339	4.33	7.64310	-6.32159	0.110100	58.4170	0.708127	-0.731403
3.89	2.10619	0.348945	4.43605	0.528752	-0.381908	4.34	8.13684	-6.77321	0.103767	66.2570	0.713700	-0.741021
3.90	2.14045	0.344860	4.58151	0.531744	-0.388527	4.35	8.70995	-7.28654	0.0974220	75.7936	0.719361	-0.750729
3.91	2.17589	0.340805	4.73450	0.534775	-0.395199	4.36	9.35704	-7.87684	0.0910048	87.5541	0.725112	-0.760530
3.92	2.21299	0.336768	4.89555	0.537816	-0.401922	4.37	10.1137	-8.55231	0.0845344	102.288	0.730955	-0.770425
3.93	2.25061	0.332759	5.06524	0.540956	-0.408698	4.38	11.0040	-9.33812	0.0780101	121.089	0.736832	-0.780415
3.94	2.28902	0.328769	5.24419	0.544107	-0.415527	4.39	12.0366	-10.2393	0.0715311	144.7603	0.742927	-0.790501
3.95	2.33090	0.324801	5.43311	0.547299	-0.422410	4.40	13.3569	-11.44592	0.0647567	176.406	0.749059	-0.800665
3.96	2.37334	0.320861	5.63273	0.550533	-0.429348	4.41	14.9567	-12.9404	0.0581061	223.703	0.755292	-0.810999
3.97	2.41711	0.316943	5.84308	0.553810	-0.436341	4.42	16.9926	-14.7783	0.0515965	289.747	0.761627	-0.821354
3.98	2.46233	0.313032	6.06578	0.557130	-0.443390	4.43	19.6708	-17.1348	0.0445531	389.939	0.768067	-0.831841
3.99	2.51088	0.298167	6.30452	0.560495	-0.450495	4.44	23.3522	-20.5151	0.0376891	545.324	0.774615	-0.842433
4.00	2.56049	0.293279	6.55610	0.563905	-0.457658	4.45	28.7900	-25.3656	0.0307656	825.413	0.781272	-0.853130
4.01	2.61217	0.288355	6.82343	0.567361	-0.464878	4.46	37.3277	-33.1126	0.0237817	1333.35	0.788041	-0.863935
4.02	2.66606	0.283388	7.10787	0.570863	-0.472157	4.47	52.2711	-47.3793	0.0167367	2837.84	0.794925	-0.874849
4.03	2.72230	0.278407	7.41090	0.574413	-0.479496	4.48	92.9960	-83.2886	0.00962948	8668.26	0.801926	-0.885874
4.04	2.78104	0.273376	7.74418	0.578011	-0.486894	4.49	165.751	-128.980	0.0025924	133774	0.809047	-0.897011
4.05	2.84246	0.268312	8.07955	0.581659	-0.494353	4.50	-189.213	170.947	-0.00477498	35601.6	0.816291	-0.908263



TABLE I.- COMPRESSION - Continued

$\left(\frac{L}{J}\right)_{\text{eff}}$	C	$\frac{S_{II}}{\bar{E}I/L}$	$\frac{S}{\bar{E}I/L}$	C <sup>2</sup>	$\frac{S^2 C^2}{(\bar{E}I/L)^2}$	$\frac{S_{IV}}{\bar{E}I/L}$	$\left(\frac{L}{J}\right)_{\text{eff}}$	C	$\frac{S_{II}}{\bar{E}I/L}$	$\frac{S}{\bar{E}I/L}$	C <sup>2</sup>	$\frac{S^2 C^2}{(\bar{E}I/L)^2}$	$\frac{S_{IV}}{\bar{E}I/L}$
4.51	-75.1553	68.2048	-0.0120741	5649.83	0.823660	-0.919632	4.96	-2.71356	2.7880	-0.428829	7.36339	1.35408	-1.5248
4.52	-46.8889	42.1775	-0.0264392	2199.51	8.31158	-0.91118	4.97	-2.65850	2.67393	-0.440687	7.06763	1.37257	-1.61226
4.53	-34.0830	31.1882	-0.0268713	1161.65	8.76787	-0.942725	4.98	-2.60576	2.62110	-0.452697	6.78997	1.39150	-1.6231
4.54	-26.7689	24.5953	-0.0343712	716.577	8.64551	-0.954453	4.99	-2.55519	2.57020	-0.464860	6.52898	1.41068	-1.63266
4.55	-22.0401	20.3312	-0.0419402	485.765	8.54452	-0.966306	5.00	-2.50666	2.52111	-0.477180	6.28355	1.43073	-1.64351
4.56	-18.7317	17.3467	-0.0525793	350.878	8.62495	-0.978285	5.01	-2.46006	2.47373	-0.489661	6.05191	1.45106	-1.65426
4.57	-16.2675	15.1407	-0.0572895	265.283	8.70682	-0.990393	5.02	-2.41528	2.42794	-0.502397	5.83358	1.47188	-1.66552
4.58	-14.4080	13.4422	-0.0650721	207.590	8.79016	-1.002673	5.03	-2.37222	2.38367	-0.515120	5.62741	1.49323	-1.67710
4.59	-12.9178	12.0966	-0.0726221	166.871	8.87502	-1.015000	5.04	-2.33077	2.34103	-0.528106	5.43251	1.51510	-1.68900
4.60	-11.7074	11.0020	-0.0808587	137.064	8.96143	-1.02751	5.05	-2.29087	2.29934	-0.541267	5.24807	1.53752	-1.70124
4.61	-10.7048	10.0945	-0.0888651	114.593	9.04943	-1.04015	5.06	-2.25241	2.25912	-0.554607	5.07337	1.56052	-1.80381
4.62	-9.86073	9.32975	-0.0969487	97.2340	9.13902	-1.05293	5.07	-2.21534	2.22011	-0.568132	4.90774	1.58409	-1.82674
4.63	-9.14036	8.67647	-0.105110	83.5462	9.23036	-1.06586	5.08	-2.17958	2.18225	-0.581845	4.75057	1.60828	-1.85002
4.64	-8.51839	8.11180	-0.113352	72.5630	9.32337	-1.07893	5.09	-2.14506	2.14547	-0.595752	4.60329	1.63309	-1.87368
4.65	-7.97597	7.61677	-0.121674	63.6161	9.41813	-1.09214	5.10	-2.11173	2.11073	-0.609655	4.46359	1.65855	-1.89770
4.66	-7.49878	7.16447	-0.130079	56.2316	9.51469	-1.10551	5.11	-2.07952	2.07496	-0.624161	4.32440	1.68469	-1.92212
4.67	-7.07572	6.79829	-0.138567	50.0659	9.61309	-1.11903	5.12	-2.04838	2.04112	-0.638675	4.19587	1.71152	-1.94692
4.68	-6.69811	6.47141	-0.147141	44.8647	9.71338	-1.13271	5.13	-2.01827	2.00817	-0.653400	4.07341	1.73937	-1.97214
4.69	-6.35901	6.14431	-0.155801	40.1770	9.81561	-1.14654	5.14	-1.98913	1.97606	-0.668344	3.95665	1.76777	-1.99777
4.70	-6.05282	5.836397	-0.164549	36.5367	9.91984	-1.16053	5.15	-1.96093	1.94475	-0.683511	3.84523	1.79644	-2.02382
4.71	-5.77499	5.60914	-0.173386	33.3506	1.00261	-1.17469	5.16	-1.93361	1.91420	-0.698906	3.73885	1.82632	-2.05032
4.72	-5.52177	5.37645	-0.182315	30.4699	1.01345	-1.18902	5.17	-1.90715	1.89438	-0.714536	3.63721	1.85702	-2.07667
4.73	-5.29039	5.16309	-0.191336	27.9644	1.02450	-1.20351	5.18	-1.88150	1.88526	-0.730408	3.54004	1.88859	-2.10426
4.74	-5.07716	4.96671	-0.200452	25.7775	1.03577	-1.21818	5.19	-1.85663	1.86281	-0.746826	3.44707	1.92106	-2.13255
4.75	-4.88096	4.78531	-0.209664	23.8237	1.04727	-1.23302	5.20	-1.83251	1.79698	-0.762898	3.35809	1.95445	-2.16092
4.76	-4.69954	4.61722	-0.218974	22.0857	1.05900	-1.24805	5.21	-1.80910	1.77176	-0.779531	3.27286	1.98881	-2.18978
4.77	-4.53132	4.46097	-0.228363	20.529	1.07097	-1.26326	5.22	-1.78639	1.74513	-0.796132	3.19118	2.02418	-2.21917
4.78	-4.37490	4.31534	-0.237894	19.1398	1.08318	-1.27866	5.23	-1.76453	1.72304	-0.813607	3.11266	2.06058	-2.24908
4.79	-4.22910	4.17924	-0.247507	17.8853	1.09565	-1.29424	5.24	-1.74291	1.69349	-0.831065	3.03773	2.09897	-2.27954
4.80	-4.09288	4.05174	-0.257227	16.7516	1.10836	-1.31002	5.25	-1.72210	1.66844	-0.848613	2.96561	2.13668	-2.31055
4.81	-3.96532	3.93202	-0.267053	15.7237	1.12137	-1.32600	5.26	-1.70187	1.64388	-0.866660	2.89836	2.17646	-2.34214
4.82	-3.84563	3.81937	-0.276986	14.7689	1.13464	-1.34219	5.27	-1.68221	1.61978	-0.885214	2.82362	2.21746	-2.37433
4.83	-3.73312	3.71315	-0.287035	13.8362	1.14819	-1.35857	5.28	-1.66309	1.59614	-0.903884	2.75866	2.25932	-2.40712
4.84	-3.62716	3.61280	-0.297196	13.0163	1.16203	-1.37517	5.29	-1.64449	1.57292	-0.922879	2.70436	2.30322	-2.44055
4.85	-3.52721	3.51784	-0.307471	12.4412	1.17617	-1.39199	5.30	-1.62640	1.55011	-0.942210	2.64518	2.34828	-2.47462
4.86	-3.43276	3.42781	-0.317865	11.7839	1.19062	-1.40902	5.31	-1.60880	1.52769	-0.961864	2.58823	2.39468	-2.50936
4.87	-3.34339	3.34339	-0.328379	11.1782	1.20536	-1.42628	5.32	-1.59166	1.50565	-0.981911	2.53338	2.44258	-2.54479
4.88	-3.25869	3.26102	-0.339015	10.6191	1.22047	-1.44376	5.33	-1.57408	1.48398	-1.00231	2.48056	2.49203	-2.58093
4.89	-3.17833	3.18358	-0.349777	10.1018	1.23589	-1.46148	5.34	-1.55873	1.46265	-1.02302	2.42365	2.54311	-2.61780
4.90	-3.10197	3.10973	-0.360666	9.62219	1.25165	-1.47944	5.35	-1.54291	1.44166	-1.04424	2.36807	2.59589	-2.65542
4.91	-3.02932	3.03919	-0.371685	9.17680	1.26777	-1.49764	5.36	-1.52750	1.42098	-1.06581	2.31325	2.65044	-2.69383
4.92	-2.96175	2.97175	-0.382837	8.76244	1.28426	-1.51609	5.37	-1.51248	1.40062	-1.08778	2.26059	2.70665	-2.73303
4.93	-2.89416	2.90416	-0.394124	8.37628	1.30112	-1.53479	5.38	-1.49784	1.38055	-1.11019	2.21019	2.76519	-2.77308
4.94	-2.83122	2.84527	-0.405550	8.01887	1.31837	-1.55298	5.39	-1.48352	1.36077	-1.13303	2.16000	2.82557	-2.81398
4.95	-2.77108	2.78587	-0.417117	7.67686	1.33602	-1.57298	5.40	-1.46967	1.34126	-1.15634	2.11593	2.88867	-2.85577

TABLE I.- COMPRESSION - Continued

$\left(\frac{L}{J}\right)_{\text{eff}}$	C	$\frac{S_{II}}{\bar{E}I/L}$	$\frac{S}{\bar{E}I/L}$	C <sup>2</sup>	$\frac{S^2 C^2}{(\bar{E}I/L)^2}$	$\frac{S_{IV}}{\bar{E}I/L}$
4.96	-2.71356	2.7880	-0.428829	7.36339	1.35408	-1.59218
4.97	-2.65850	2.67393	-0.440687	7.06763	1.37257	-1.61226
4.98	-2.60576	2.62110	-0.452697	6.78997	1.39150	-1.63231
4.99	-2.55519	2.57020	-0.464860	6.52898	1.41068	-1.65266
5.00	-2.50666	2.52111	-0.477180	6.28355	1.43073	-1.67331
5.01	-2.46006	2.47373	-0.489661	6.05191	1.45106	-1.69426
5.02	-2.41528	2.42794	-0.502397	5.83358	1.47188	-1.71552
5.03	-2.37222	2.38367	-0.515120	5.62741	1.49323	-1.73710
5.04	-2.33077	2.34103	-0.528106	5.43251	1.51510	-1.75900
5.05	-2.29087	2.29934	-0.541267	5.24807	1.53752	-1.78124
5.06	-2.25241	2.25912	-0.554607	5.07337	1.56052	-1.80381
5.07	-2.21534	2.22011	-0.568132	4.90774	1.58409	-1.82674
5.08	-2.17958	2.18225	-0.581845	4.75057	1.60828	-1.85002
5.09	-2.14506	2.14547	-0.595752	4.60329	1.63309	-1.87368
5.10	-2.11173	2.10973	-0.609655	4.46359	1.65855	-1.89770
5.11	-2.07952	2.07496	-0.624161	4.32440	1.68469	-1.92212
5.12	-2.04838	2.04112	-0.638675	4.19587	1.71152	-1.94692
5.13	-2.01827	2.00817	-0.653400	4.07341	1.73937	-1.97214
5.14	-1.98913	1.97606	-0.668344	3.95665	1.76777	-1.99777
5.15	-1.96093	1.94475	-0.683511	3.84523	1.79644	-2.02382
5.16	-1.93361	1.91420	-0.698906	3.73885	1.82632	-2.05032
5.17	-1.90715	1.89438	-0.714536	3.63721	1.85702	-2.07726
5.18	-1.88150	1.88526	-0.730408	3.54004	1.88859	-2.10467
5.19	-1.85663	1.86281	-0.746826	3.44707	1.92106	-2.13255
5.20	-1.83251	1.79698	-0.762898	3.35809	1.95445	-2.16092
5.21	-1.80910	1.77176	-0.779531	3.27286	1.98881	-2.18978
5.22	-1.78639	1.74513	-0.796432	3.19118	2.02418	-2.21917
5.23	-1.76433	1.71904	-0.813607	3.11286	2.06058	-2.24908
5.24	-1.74291	1.69349	-0.831065	3.03773	2.09807	-2.27954
5.25	-1.72210	1.66844	-0.848813	2.96561	2.13668	-2.31055
5.26	-1.70187	1.64388	-0.866660	2.89636	2.17646	-2.34214
5.27	-1.68221	1.61978	-0.885214	2.82982	2.21746	-2.37473
5.28	-1.66309	1.59641	-0.903484	2.76586	2.25973	-2.40712
5.29	-1.64449	1.57292	-0.922879	2.70436	2.30332	-2.44055
5.30	-1.62610	1.55011	-0.942210	2.64518	2.34828	-2.47462
5.31	-1.60880	1.52769	-0.961864	2.58823	2.39458	-2.50936
5.32	-1.59166	1.50563	-0.981914	2.53330	2.44258	-2.54479
5.33	-1.57498	1.48398	-1.00231	2.48036	2.49205	-2.58083
5.34	-1.55873	1.46265	-1.02302	2.42965	2.54311	-2.61780
5.35	-1.54291	1.44166	-1.04428	2.38057	2.59589	-2.65542
5.36	-1.52750	1.42098	-1.06581	2.3325	2.65044	-2.69383
5.37	-1.51248	1.40062	-1.08778	2.28559	2.70685	-2.73303
5.38	-1.49784	1.38055	-1.11019	2.23953	2.76519	-2.77308
5.39	-1.48358	1.36077	-1.13303	2.20100	2.82557	-2.81368
5.40	-1.46967	1.34126	-1.15637	2.16993	2.88807	-2.85577





TABLE I.- COMPRESSION - Continued

TABLE I.- COMPRESSION - Concluded

$\left(\frac{1}{j}\right)_{\text{eff}}$	C	$\frac{S}{EI/L}$	C <sup>2</sup>	$\frac{S^2 C^2}{(EI/L)^2}$	$\frac{SIV}{EI/L}$	$\left(\frac{1}{j}\right)_{\text{eff}}$	C	$\frac{SII}{EI/L}$	$\frac{S}{EI/L}$	C <sup>2</sup>	$\frac{S^2 C^2}{(EI/L)^2}$	$\frac{SIV}{EI/L}$
5.41	-1.45611	1.32202	2.12025	2.95278	-2.89848	5.86	-1.08984	0.612739	-3.26342	1.18776	12.6495	-6.82004
5.42	-1.44289	1.30303	2.08382	3.03983	-2.94213	5.87	-1.08559	.586672	-3.25747	1.17351	13.2626	-7.00200
5.43	-1.42999	1.28413	2.04487	3.09931	-2.98678	5.88	-1.08128	.561623	-3.25147	1.16916	13.9044	-7.19289
5.44	-1.41741	1.26577	2.00505	3.16136	-3.02444	5.89	-1.07718	.537087	-3.24599	1.16031	14.5698	-7.39336
5.45	-1.40534	1.24748	1.97441	3.23609	-3.07915	5.90	-1.07319	.512562	-3.24087	1.15174	15.2646	-7.60419
5.46	-1.39316	1.22940	1.94090	3.31363	-3.12696	5.91	-1.06932	.488507	-3.23601	1.14345	16.0000	-7.82621
5.47	-1.38118	1.21154	1.90848	3.39418	-3.17590	5.92	-1.06557	.465046	-3.23145	1.13511	16.7668	-8.06032
5.48	-1.36908	1.19387	1.87711	3.47775	-3.22602	5.93	-1.06193	.442127	-3.22711	1.12771	17.5661	-8.30756
5.49	-1.35685	1.17640	1.84674	3.56465	-3.27736	5.94	-1.05841	.419732	-3.22298	1.12023	18.3980	-8.56911
5.50	-1.34489	1.15911	1.81733	3.65498	-3.32996	5.95	-1.05500	.397843	-3.21904	1.11302	19.2620	-8.84622
5.51	-1.33748	1.14200	1.78886	3.74894	-3.38388	5.96	-1.05169	.376491	-3.21530	1.10606	20.1680	-9.13033
5.52	-1.32713	1.12506	1.76128	3.84673	-3.43916	5.97	-1.04850	.355686	-3.21171	1.09935	21.1055	-9.42307
5.53	-1.31703	1.10828	1.73456	3.94854	-3.49587	5.98	-1.04541	.335429	-3.20829	1.09289	22.0780	-9.72628
5.54	-1.30716	1.09166	1.70867	4.05461	-3.55405	5.99	-1.04244	.315722	-3.20509	1.08667	23.0860	-10.04121
5.55	-1.29753	1.07519	1.68358	4.16516	-3.61377	6.00	-1.03956	.296565	-3.20209	1.08069	24.1290	-10.36771
5.56	-1.28812	1.05887	1.65926	4.28047	-3.67509	6.01	-1.03680	.277943	-3.19924	1.07495	25.2080	-10.70514
5.57	-1.27894	1.04269	1.63568	4.40079	-3.73808	6.02	-1.03413	.259856	-3.19654	1.06943	26.3230	-11.05446
5.58	-1.26997	1.02664	1.61282	4.52614	-3.80281	6.03	-1.03158	.242303	-3.19399	1.06415	27.4740	-11.41600
5.59	-1.26121	1.01071	1.59065	4.65767	-3.86935	6.04	-1.02912	.225284	-3.19157	1.05909	28.6610	-11.79037
5.60	-1.25266	.994913	1.56915	4.79489	-3.93779	6.05	-1.02677	.208799	-3.18927	1.05425	29.8840	-12.17793
5.61	-1.24431	.979230	1.54830	4.93843	-4.00820	6.06	-1.02452	.192841	-3.18702	1.04963	31.1440	-12.57937
5.62	-1.23615	.963660	1.52807	5.08870	-4.08068	6.07	-1.02236	.177419	-3.18482	1.04523	32.4460	-12.99625
5.63	-1.22819	.948198	1.50845	5.24408	-4.15532	6.08	-1.02031	.162533	-3.18266	1.04104	33.7890	-13.42907
5.64	-1.22041	.932838	1.48941	5.41108	-4.23223	6.09	-1.01837	.148197	-3.18057	1.03707	35.1730	-13.87800
5.65	-1.21282	.917577	1.47093	5.58416	-4.31150	6.10	-1.01651	.134411	-3.17857	1.03330	36.6080	-14.34331
5.66	-1.20541	.902410	1.45301	5.76595	-4.39326	6.11	-1.01476	.121178	-3.17666	1.02975	38.0940	-14.82600
5.67	-1.19817	.887332	1.43561	5.95674	-4.47762	6.12	-1.01311	.108494	-3.17482	1.02639	39.6310	-15.32607
5.68	-1.19111	.872339	1.41873	6.15704	-4.56471	6.13	-1.01156	.096356	-3.17305	1.02325	41.2190	-15.84395
5.69	-1.18421	.857427	1.40235	6.36604	-4.65467	6.14	-1.01010	.084762	-3.17135	1.02031	42.8590	-16.37931
5.70	-1.17748	.842593	1.38645	6.59107	-4.74766	6.15	-1.00874	.073711	-3.16971	1.01757	44.5510	-16.93300
5.71	-1.17090	.827831	1.37102	6.82554	-4.84382	6.16	-1.00749	.063194	-3.16811	1.01503	46.2950	-17.50500
5.72	-1.16449	.813139	1.35604	7.07230	-4.94331	6.17	-1.00632	.053211	-3.16656	1.01269	48.0910	-18.09700
5.73	-1.15824	.798517	1.34151	7.33415	-5.04634	6.18	-1.00526	.043762	-3.16505	1.01055	49.9390	-18.70900
5.74	-1.15213	.783947	1.32741	7.61031	-5.15309	6.19	-1.00429	.034847	-3.16358	1.00860	51.8390	-19.34200
5.75	-1.14618	.769440	1.31372	7.90253	-5.26377	6.20	-1.00342	.026462	-3.16215	1.00686	53.7910	-19.99600
5.76	-1.14037	.754987	1.30044	8.21206	-5.37860	6.21	-1.00265	.018614	-3.16076	1.00531	55.8050	-20.67100
5.77	-1.13471	.740586	1.28756	8.54029	-5.49783	6.22	-1.00198	.011299	-3.15941	1.00396	57.8810	-21.36800
5.78	-1.12918	.726232	1.27506	8.88875	-5.62171	6.23	-1.00140	.004511	-3.15811	1.00281	59.9990	-22.08800
5.79	-1.12380	.711924	1.26293	9.25909	-5.75054	6.24	-1.00093	.000947	-3.15686	1.00185	62.1590	-22.83100
5.80	-1.11856	.697656	1.25117	9.65319	-5.88461	6.25	-1.00055	.000190	-3.15566	1.00110	64.3690	-23.59600
5.81	-1.11345	.683427	1.23976	10.0731	-6.02427	6.26	-1.00027	.000000	-3.15451	1.00054	66.6290	-24.38400
5.82	-1.10847	.669232	1.22870	10.5211	-6.16995	6.27	-1.00009	.000000	-3.15341	1.00017	68.9490	-25.19400
5.83	-1.10362	.655069	1.21798	10.9998	-6.32179	6.28	-1.00001	.000000	-3.15236	1.00001	71.3190	-26.02600
5.84	-1.09890	.640934	1.20759	11.5119	-6.48047	2w	-1.00000	.000000	-3.15136	1.00000	73.7490	-26.88000
5.85	-1.09431	.626825	1.19752	12.0606	-6.64636							





TABLE II.- TENSION

$\left(\frac{L}{J}\right)_{\text{eff}}$	c	$\frac{sII}{EI/L}$	$\frac{s}{EI/L}$	c <sup>2</sup>	$\frac{s^2C^2}{(EI/L)^2}$	$\frac{sIV}{EI/L}$
0	0.500000	0.750000	1.00000	0.250000	0.250000	0.500000
.1	.499757	.750512	1.00036	.249757	.249936	.500422
.2	.499001	.751996	1.00133	.249002	.249665	.501666
.3	.497760	.754488	1.00300	.247765	.249252	.503744
.4	.496033	.757964	1.00532	.246049	.248675	.506649
.5	.493831	.762412	1.00831	.243869	.247937	.510374
.6	.491167	.767818	1.01194	.241245	.247042	.514911
.7	.488057	.774165	1.01623	.238200	.245994	.520252
.8	.484519	.781431	1.02116	.234759	.244798	.526386
.9	.480575	.789595	1.02672	.230953	.243459	.533303
1.0	.476246	.798632	1.03291	.226810	.241983	.540988
1.1	.471556	.808515	1.03971	.222365	.240376	.549428
1.2	.466530	.819215	1.04712	.217651	.238646	.558608
1.3	.461194	.830703	1.05513	.212700	.236799	.568510
1.4	.455575	.842949	1.06372	.207548	.234843	.579118
1.5	.449699	.855921	1.07289	.202229	.232785	.590413
1.6	.443594	.869586	1.08262	.196775	.230633	.602376
1.7	.437286	.883915	1.09290	.191219	.228396	.614989
1.8	.430802	.898873	1.10371	.185590	.226081	.628230
1.9	.424167	.914429	1.11505	.179918	.223697	.642080
2.0	.417408	.930553	1.12689	.174229	.221251	.656518
2.1	.410548	.947214	1.13923	.168550	.218751	.671522
2.2	.403610	.964380	1.15205	.162901	.216205	.687071
2.3	.396616	.982024	1.16534	.157305	.213621	.703145
2.4	.389588	1.00012	1.17908	.151779	.211006	.719723
2.5	.382544	1.01863	1.19325	.146340	.208366	.736702
2.6	.375502	1.03754	1.20785	.141002	.205709	.754303
2.7	.368480	1.05683	1.22287	.135777	.203042	.772264
2.8	.361492	1.07646	1.23827	.130677	.200369	.790646
2.9	.354553	1.09642	1.25406	.125708	.197697	.809429
3.0	.347676	1.11668	1.27022	.120878	.195032	.828594
3.1	.340871	1.13722	1.28673	.116193	.192378	.848120
3.2	.334149	1.15803	1.30358	.111656	.189740	.867991
3.3	.327520	1.17909	1.32076	.107269	.187122	.888188
3.4	.320990	1.20037	1.33826	.103034	.184529	.908693
3.5	.314566	1.22188	1.35606	.0989519	.181963	.929491
3.6	.308255	1.24358	1.37416	.0950214	.179429	.950564
3.7	.302062	1.26547	1.39253	.0912413	.176929	.971898
3.8	.295990	1.28754	1.41117	.0876098	.174466	.993477
3.9	.290042	1.30976	1.43007	.0841242	.172042	1.01529
4.0	.284221	1.33214	1.44921	.0807615	.169658	1.03731
4.1	.278529	1.35466	1.46859	.0775783	.167318	1.05955
4.2	.272967	1.37731	1.48820	.0745108	.165022	1.08197
4.3	.267535	1.40009	1.50802	.0715749	.162771	1.10457
4.4	.262234	1.42297	1.52805	.0687666	.160566	1.12735
4.5	.257063	1.44597	1.54828	.0660815	.158409	1.15028
4.6	.252022	1.46907	1.56870	.0635151	.156300	1.17335
4.7	.247110	1.49225	1.58930	.0610631	.154238	1.19657
4.8	.242324	1.51553	1.61008	.0587210	.152225	1.21992
4.9	.237664	1.53889	1.63101	.0564843	.150260	1.24338
5.0	.233128	1.56232	1.65211	.0543486	.148343	1.26696



TABLE II.- TENSION - Continued

$\left(\frac{L}{J}\right)_{\text{eff}}$	C	$\frac{SII}{EI/L}$	$\frac{S}{EI/L}$	$C^2$	$\frac{S^2C^2}{(EI/L)^2}$	$\frac{SIV}{EI/L}$	$\left(\frac{L}{J}\right)_{\text{eff}}$	C	$\frac{SII}{EI/L}$	$\frac{S}{EI/L}$	$C^2$	$\frac{S^2C^2}{(EI/L)^2}$	$\frac{SIV}{EI/L}$
5.1	0.228713	1.58583	1.67336	0.0523097	0.146475	1.29064	9.6	0.116128	2.67907	2.71569	0.0134857	0.0934567	2.40033
5.2	0.224418	1.60940	1.69476	0.0503634	0.141654	1.29144	9.7	0.11806	2.70374	2.73987	0.0131804	0.0919421	2.42530
5.3	0.220239	1.63304	1.71629	0.0485054	0.136880	1.29224	9.8	0.119513	2.72841	2.76402	0.0128852	0.0904409	2.445027
5.4	0.216176	1.65674	1.73795	0.0467319	0.132153	1.29304	9.9	0.122248	2.75309	2.78822	0.0125996	0.0879515	2.47525
5.5	0.212224	1.68049	1.75974	0.0450388	0.127422	1.29384	10.0	0.111010	2.77778	2.81244	0.0123233	0.0974746	2.50033
5.6	0.208381	1.70429	1.78166	0.0434225	0.122696	1.29464	10.1	0.09799	2.80247	2.83667	0.0120558	0.0970094	2.52531
5.7	0.204645	1.72814	1.80368	0.0418794	0.118025	1.29544	10.2	0.08611	2.82717	2.86092	0.0117968	0.095557	2.55019
5.8	0.201012	1.75204	1.82582	0.0404059	0.113354	1.29624	10.3	0.07452	2.85188	2.88519	0.0115460	0.0941130	2.57517
5.9	0.197481	1.77599	1.84806	0.0389887	0.108683	1.29704	10.4	0.06316	2.87660	2.90948	0.0113030	0.0926810	2.60016
6.0	0.194048	1.79997	1.87040	0.0376547	0.104012	1.29784	10.5	0.05202	2.90132	2.93379	0.0110675	0.0922592	2.62514
6.1	0.190711	1.82400	1.89284	0.0363706	0.099340	1.29864	10.6	0.04112	2.92604	2.95811	0.0108392	0.0918475	2.65013
6.2	0.187466	1.84806	1.91537	0.0351337	0.094669	1.29944	10.7	0.03043	2.95077	2.98244	0.0106179	0.0914451	2.67512
6.3	0.184312	1.87215	1.93799	0.0339710	0.090000	1.30024	10.8	0.01996	2.97551	3.00679	0.0104032	0.0910527	2.70011
6.4	0.181245	1.89628	1.96069	0.0328499	0.085525	1.30104	10.9	0.00969	3.00025	3.03115	0.0101912	0.0906691	2.72510
6.5	0.178264	1.92044	1.98348	0.0317779	0.081050	1.30184	11.0	0.099633	3.02500	3.05553	0.00999265	0.0932942	2.75009
6.6	0.175364	1.94463	2.00633	0.0307526	0.076575	1.30264	11.1	0.089767	3.04975	3.07992	0.00979638	0.0929279	2.77508
6.7	0.172544	1.96885	2.02927	0.0297715	0.072100	1.30344	11.2	0.080092	3.07451	3.10433	0.00960500	0.0925698	2.80008
6.8	0.169802	1.99311	2.05227	0.0288326	0.067625	1.30424	11.3	0.070602	3.09927	3.12875	0.00942069	0.0922196	2.82507
6.9	0.167134	2.01737	2.07534	0.0279338	0.063150	1.30504	11.4	0.061293	3.12404	3.15318	0.00924084	0.0918773	2.85006
7.0	0.164559	2.04166	2.09847	0.0270730	0.058675	1.30584	11.5	0.052159	3.14881	3.17762	0.00906607	0.0915424	2.87506
7.1	0.162013	2.06592	2.12167	0.0262484	0.054200	1.30664	11.6	0.043196	3.17358	3.20207	0.00889618	0.0912148	2.90005
7.2	0.159556	2.09032	2.14493	0.0254582	0.049725	1.30744	11.7	0.034398	3.19836	3.22651	0.00873100	0.0908943	2.92504
7.3	0.157184	2.11468	2.16824	0.0247007	0.045250	1.30824	11.8	0.025762	3.22315	3.25101	0.00857035	0.0905800	2.95004
7.4	0.154836	2.13906	2.19160	0.0239743	0.040775	1.30904	11.9	0.017283	3.24794	3.27550	0.00841403	0.0902736	2.97504
7.5	0.152570	2.16346	2.21502	0.0232775	0.036300	1.30984	12.0	0.008957	3.27273	3.29999	0.00826203	0.0899730	3.00004
7.6	0.150363	2.18788	2.23849	0.0226089	0.031825	1.31064	12.1	0.000780	3.29752	3.32450	0.00811404	0.0896787	3.02503
7.7	0.148213	2.21231	2.26200	0.0219671	0.027350	1.31144	12.2	0.062748	3.32232	3.34901	0.00796998	0.0893904	3.05003
7.8	0.146119	2.23676	2.28556	0.0213507	0.022875	1.31224	12.3	0.054857	3.34712	3.37354	0.00782971	0.0891081	3.07503
7.9	0.144079	2.26123	2.30917	0.0207586	0.018400	1.31304	12.4	0.047103	3.37193	3.39807	0.00769310	0.0888311	3.10003
8.0	0.142090	2.28571	2.33281	0.0201897	0.013925	1.31384	12.5	0.039484	3.39674	3.42261	0.00756003	0.0885503	3.12502
8.1	0.140152	2.31021	2.35650	0.0196427	0.009450	1.31464	12.6	0.031996	3.42155	3.44717	0.00743037	0.0882947	3.15002
8.2	0.138263	2.33472	2.38022	0.0191167	0.004975	1.31544	12.7	0.024635	3.44637	3.47172	0.00730400	0.0880342	3.17502
8.3	0.136421	2.35925	2.40399	0.0186107	0.000500	1.31624	12.8	0.017398	3.47119	3.49629	0.00718083	0.0877789	3.20002
8.4	0.134625	2.38378	2.42778	0.0181238	0.000025	1.31704	12.9	0.010282	3.49601	3.52087	0.00706074	0.0875285	3.22502
8.5	0.132872	2.40833	2.45162	0.0176550	0.000000	1.31784	13.0	0.0033281	3.52083	3.54545	0.00694363	0.0872830	3.25001
8.6	0.131162	2.43289	2.47548	0.0172035	0.000000	1.31864	13.1	0.0826402	3.54566	3.57004	0.00682944	0.0870421	3.27501
8.7	0.129494	2.45747	2.49938	0.0167686	0.000000	1.31944	13.2	0.019632	3.57049	3.59464	0.00671797	0.0868056	3.30001
8.8	0.127865	2.48205	2.52331	0.0163495	0.000000	1.32024	13.3	0.012972	3.59533	3.61925	0.00660923	0.0865739	3.32501
8.9	0.126275	2.50665	2.54726	0.0159454	0.000000	1.32104	13.4	0.0066419	3.62016	3.64386	0.00650311	0.0863464	3.35001
9.0	0.124722	2.53125	2.57125	0.0155557	0.000000	1.32184	13.5	0.0099970	3.64500	3.66848	0.00639953	0.0861230	3.37501
9.1	0.123206	2.55586	2.59526	0.0151797	0.000000	1.32264	13.6	0.0093624	3.66984	3.69310	0.00629839	0.0859036	3.40001
9.2	0.121730	2.58049	2.61930	0.0148169	0.000000	1.32344	13.7	0.0077377	3.69469	3.71773	0.00619963	0.0856885	3.42501
9.3	0.120277	2.60512	2.64336	0.0144666	0.000000	1.32424	13.8	0.0071328	3.71953	3.74237	0.00610317	0.0854771	3.45001
9.4	0.118862	2.62976	2.66745	0.0141283	0.000000	1.32504	13.9	0.0075514	3.74438	3.76702	0.00600895	0.0852691	3.47501
9.5	0.117480	2.65441	2.69156	0.0138015	0.000000	1.32584	14.0	0.0069213	3.76927	3.79167	0.00591688	0.0850654	3.50001





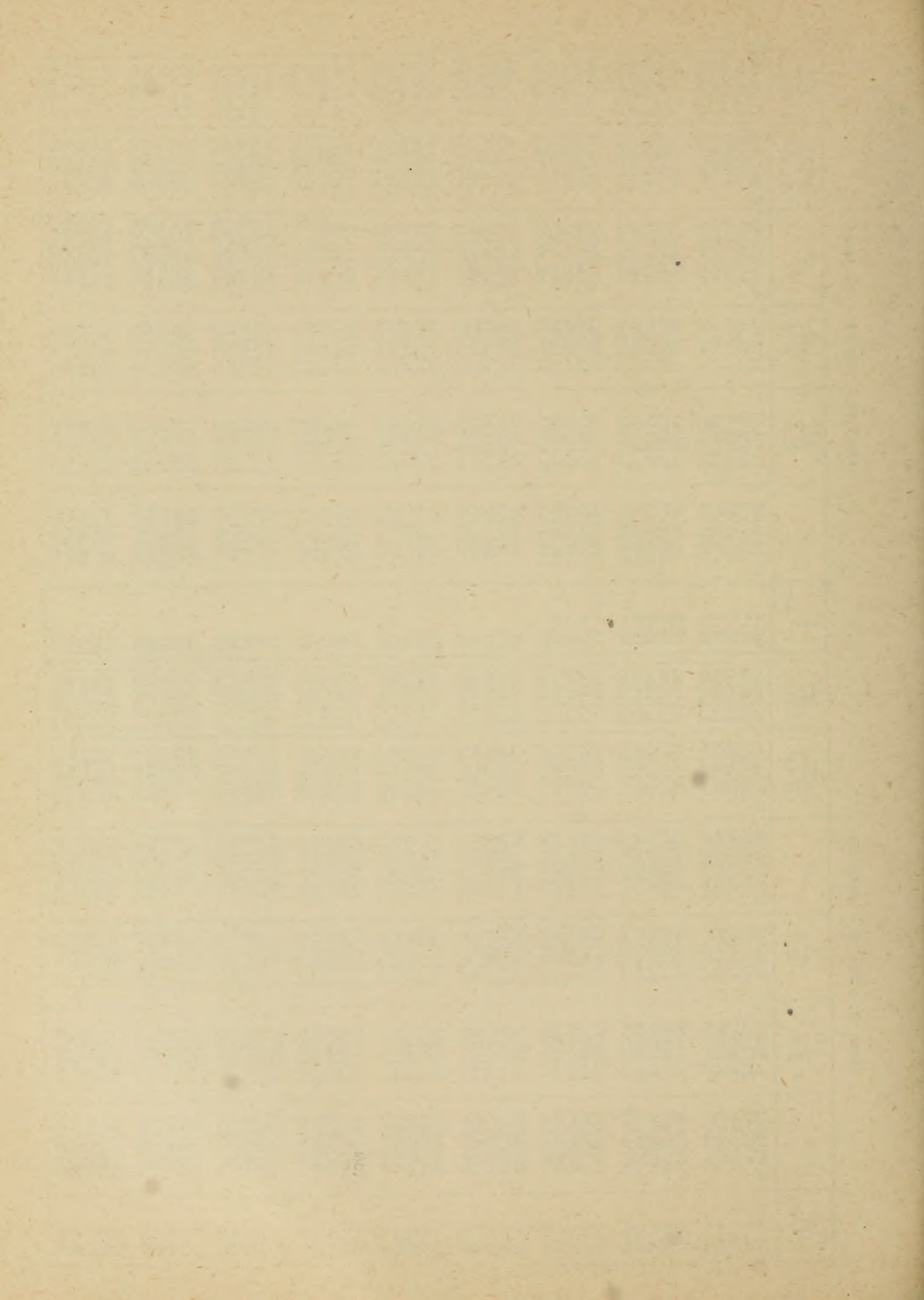
TABLE II.- TENSION - Concluded

$\left(\frac{1}{j}\right)_{eff}$	$c$	$\frac{s}{E/L}$	$c^2$	$\frac{s^2 c^2}{(E/L)^2}$	$\frac{s^4}{E/L}$	$\frac{1}{j}$	$c$	$\frac{s^2}{E/L}$	$\frac{s}{E/L}$	$c^2$	$\frac{s^2 c^2}{(E/L)^2}$	$\frac{s^4}{E/L}$
14.1	0.0763343	3.79408	0.00582692	0.0518551	3.52501	18.6	0.0568182	4.91120	4.93012	0.00322830	0.0784674	4.65000
14.2	0.0757561	3.81632	0.00573699	0.0446681	3.55000	18.7	0.0561972	4.93120	4.95194	0.00319193	0.0783664	4.67500
14.3	0.0751866	3.84380	0.00565303	0.0417416	3.57500	18.8	0.0559758	4.94905	4.97376	0.00315617	0.0782667	4.70000
14.4	0.0746257	3.86932	0.00556899	0.0412815	3.60000	18.9	0.0558569	4.96867	5.00159	0.00312100	0.0781682	4.72500
14.5	0.0740730	3.89352	0.00548681	0.0409775	3.62500	19.0	0.0555555	5.01369	5.02941	0.00308642	0.0780709	4.75000
14.6	0.0735284	3.91838	0.00540643	0.0391337	3.65000	19.1	0.0552186	5.03681	5.05207	0.00305241	0.0779748	4.77500
14.7	0.0729918	3.94325	0.00532780	0.0373330	3.67500	19.2	0.0549478	5.06374	5.07924	0.00301896	0.0778799	4.80000
14.8	0.0724630	3.96837	0.00525088	0.0355753	3.70000	19.3	0.0546188	5.08866	5.10390	0.00298605	0.0777861	4.82500
14.9	0.0719417	3.99299	0.00517561	0.0338605	3.72500	19.4	0.0543470	5.11359	5.12874	0.00295369	0.0776935	4.85000
15.0	0.0714279	4.01876	0.00510195	0.0326055	3.75000	19.5	0.0540540	5.14351	5.15357	0.00292184	0.0776020	4.87500
15.1	0.0709214	4.04273	0.00502984	0.0303944	3.77500	19.6	0.0537634	5.16344	5.17811	0.00289051	0.0775116	4.90000
15.2	0.0704220	4.06781	0.00495926	0.0282729	3.80000	19.7	0.0534759	5.18337	5.20325	0.00285968	0.0774223	4.92500
15.3	0.0699296	4.09248	0.00489015	0.0262709	3.82500	19.8	0.0531915	5.21330	5.22869	0.00282933	0.0773340	4.95000
15.4	0.0694440	4.11731	0.00482247	0.0245180	3.85000	19.9	0.0529100	5.23323	5.25293	0.00279947	0.0772467	4.97500
15.5	0.0689651	4.14224	0.00475619	0.0228393	3.87500	20	0.0526316	5.26316	5.27778	0.00277008	0.0771605	5.00000
15.6	0.0684928	4.16712	0.00469126	0.0212331	3.90000	21	0.0500000	5.51250	5.52832	0.00250000	0.0763504	5.25000
15.7	0.0680269	4.19201	0.00462766	0.0207944	3.92500	22	0.0476190	5.76190	5.77500	0.00226757	0.0756250	5.50000
15.8	0.0675673	4.21689	0.00456534	0.0201260	3.95000	23	0.0454545	6.01136	6.02361	0.00206612	0.0749716	5.75000
15.9	0.0671138	4.24178	0.00450427	0.0191789	3.97500	24	0.0434783	6.26067	6.27272	0.00189936	0.0743302	6.00000
16.0	0.0666664	4.26667	0.00444441	0.0181632	4.00000	25	0.0416667	6.51042	6.52174	0.00173611	0.0738122	6.25000
16.1	0.0662249	4.29156	0.00438574	0.0171674	4.02500	26	0.0400000	6.76000	6.77083	0.00160000	0.0733507	6.50000
16.2	0.0657893	4.31645	0.00432823	0.0161450	4.05000	27	0.0384615	7.00962	7.02000	0.00147929	0.0729000	6.75000
16.3	0.0653593	4.34134	0.00427184	0.0151204	4.07500	28	0.0470370	7.25928	7.26923	0.00137174	0.0724652	7.00000
16.4	0.0649349	4.36623	0.00421654	0.0141064	4.10000	29	0.0357143	7.50893	7.51852	0.00127551	0.0721022	7.25000
16.5	0.0645160	4.39113	0.00416231	0.0130930	4.12500	30	0.0344828	7.75862	7.76786	0.00119906	0.0717474	7.50000
16.6	0.0641024	4.41603	0.00410912	0.0120758	4.15000	31	0.0333333	8.00833	8.01724	0.00111111	0.0714180	7.75000
16.7	0.0636941	4.44092	0.00405694	0.0110634	4.17500	32	0.0322581	8.25806	8.26667	0.00101058	0.0711111	8.00000
16.8	0.0632910	4.46582	0.00400575	0.0100530	4.20000	33	0.0312500	8.50781	8.51613	0.000976563	0.0708247	8.25000
16.9	0.0628930	4.49072	0.00395555	0.0090443	4.22500	34	0.0303030	8.75758	8.76563	0.000918274	0.0705566	8.50000
17.0	0.0624999	4.51562	0.00390624	0.0080275	4.25000	35	0.0294118	9.00735	9.01515	0.000865052	0.0703053	8.75000
17.1	0.0621117	4.54053	0.00385787	0.00701525	4.27500	36	0.0285714	9.25714	9.26471	0.000816326	0.0700692	9.00000
17.2	0.0617283	4.56543	0.00380939	0.0060292	4.30000	37	0.0277778	9.50694	9.51429	0.000771605	0.0698469	9.25000
17.3	0.0613496	4.59034	0.00376182	0.0050977	4.32500	38	0.0270270	9.75676	9.76389	0.000730460	0.0696374	9.50000
17.4	0.0609756	4.61524	0.00371802	0.0047878	4.35000	39	0.0263158	10.0066	10.0135	0.000692521	0.0694394	9.75000
17.5	0.0606060	4.64015	0.00367309	0.0046955	4.37500	40	0.0256110	10.2564	10.2632	0.000657462	0.0692521	10.0000
17.6	0.0602409	4.66506	0.00362897	0.0045528	4.40000	41	0.0250000	10.5063	10.5128	0.000625500	0.0690746	10.2500
17.7	0.0598802	4.68997	0.00358505	0.0044177	4.42500	42	0.0243902	10.7561	10.7625	0.000594884	0.0689063	10.5000
17.8	0.0595238	4.71488	0.00354308	0.0042911	4.45000	43	0.0238095	11.0060	11.0122	0.000566893	0.0687463	10.7500
17.9	0.0591716	4.73979	0.00350127	0.0041721	4.47500	44	0.0232558	11.2558	11.2619	0.000540833	0.0685941	11.0000
18.0	0.0588235	4.76471	0.00346020	0.0040515	4.50000	45	0.0227273	11.5057	11.5116	0.000516529	0.0684492	11.2500
18.1	0.0584795	4.78962	0.00341985	0.0039323	4.52500	46	0.0222222	11.7556	11.7614	0.000493827	0.0683110	11.5000
18.2	0.0581395	4.81453	0.00338020	0.0038166	4.55000	47	0.0217391	12.0054	12.0111	0.000472590	0.0681790	11.7500
18.3	0.0578034	4.83945	0.00334124	0.00370783	4.57500	48	0.0212766	12.2553	12.2609	0.000452694	0.0680529	12.0000
18.4	0.0574712	4.86437	0.00330294	0.00360733	4.60000	49	0.0208333	12.5052	12.5106	0.000434028	0.0679323	12.2500
18.5	0.0571428	4.88929	0.00326530	0.00351697	4.62500	50	0.0204082	12.7551	12.7604	0.000416493	0.0678168	12.5000

TABLE II.- TENSION - Continued

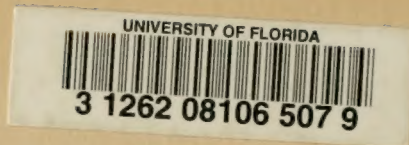
$\left(\frac{1}{j}\right)_{eff}$	$c$	$\frac{s}{EI/L}$	$\frac{s}{EI/L}$	$c^2$	$\frac{s^2 c^2}{(EI/L)^2}$	$\frac{s^4}{EI/L}$
14.1	0.0763343	3.79408	3.81632	0.00582692	0.0518551	3.52501
14.2	0.0757561	3.81894	3.84098	0.00573999	0.0466681	3.55000
14.3	0.0751866	3.84380	3.86530	0.00565303	0.0417416	3.57500
14.4	0.0746257	3.86866	3.89032	0.00556899	0.0412815	3.60000
14.5	0.0740730	3.89352	3.91500	0.00548681	0.0409775	3.62500
14.6	0.0735284	3.91838	3.93968	0.00540643	0.0391337	3.65000
14.7	0.0729918	3.94325	3.96437	0.00532780	0.0373330	3.67500
14.8	0.0724630	3.96832	3.98906	0.00525088	0.0355753	3.70000
14.9	0.0719417	3.99299	4.01376	0.00517561	0.0338605	3.72500
15.0	0.0714279	4.01786	4.03846	0.00510195	0.0322065	3.75000
15.1	0.0709214	4.04273	4.06317	0.00502984	0.0303934	3.77500
15.2	0.0704220	4.06761	4.08788	0.00495926	0.0282729	3.80000
15.3	0.0699296	4.09248	4.11239	0.00489015	0.0262709	3.82500
15.4	0.0694440	4.11736	4.13731	0.00482247	0.0245180	3.85000
15.5	0.0689651	4.14224	4.16204	0.00475619	0.0228393	3.87500
15.6	0.0684928	4.16712	4.18676	0.00469126	0.0212331	3.90000
15.7	0.0680269	4.19201	4.21150	0.00462766	0.0207944	3.92500
15.8	0.0675673	4.21689	4.23623	0.00456534	0.0219260	3.95000
15.9	0.0671138	4.24178	4.26097	0.00450427	0.0217789	3.97500
16.0	0.0666664	4.26667	4.28571	0.00444441	0.0216321	4.00000
16.1	0.0662249	4.29156	4.31046	0.00438574	0.0214874	4.02500
16.2	0.0657893	4.31645	4.33521	0.00432823	0.0213450	4.05000
16.3	0.0653593	4.34134	4.35996	0.00427184	0.0212046	4.07500
16.4	0.0649349	4.36623	4.38472	0.00421654	0.0210664	4.10000
16.5	0.0645160	4.39113	4.40948	0.00416231	0.0209301	4.12500
16.6	0.0641024	4.41603	4.43425	0.00410912	0.0207958	4.15000
16.7	0.0636941	4.44092	4.45901	0.00405694	0.0206634	4.17500
16.8	0.0632910	4.46582	4.48378	0.00400575	0.0205330	4.20000
16.9	0.0628930	4.49072	4.50856	0.00395537	0.0204043	4.22500
17.0	0.0624999	4.51562	4.53333	0.00390624	0.0202775	4.25000
17.1	0.0621117	4.54053	4.55811	0.00385787	0.0201525	4.27500
17.2	0.0617283	4.56543	4.58289	0.00380959	0.0200292	4.30000
17.3	0.0613496	4.59034	4.60768	0.00376178	0.0199077	4.32500
17.4	0.0609756	4.61524	4.63247	0.00371802	0.0197878	4.35000
17.5	0.0606060	4.64015	4.65726	0.00367309	0.0196695	4.37500
17.6	0.0602409	4.66506	4.68205	0.00362897	0.0195528	4.40000
17.7	0.0598802	4.68997	4.70685	0.00358564	0.0194377	4.42500
17.8	0.0595238	4.71488	4.73165	0.00354308	0.0193241	4.45000
17.9	0.0591716	4.73979	4.75645	0.00350127	0.0192121	4.47500
18.0	0.0588235	4.76471	4.78125	0.00346020	0.0191015	4.50000
18.1	0.0584795	4.78962	4.80606	0.00341985	0.0189923	4.52500
18.2	0.0581395	4.81453	4.83086	0.00338020	0.0188846	4.55000
18.3	0.0578034	4.83945	4.85567	0.00334124	0.0187783	4.57500
18.4	0.0574712	4.86437	4.88049	0.00330294	0.0186733	4.60000
18.5	0.0571428	4.88929	4.90530	0.00326530	0.0185697	4.62500











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